National Institute of Environmental Health Sciences

Interdisciplinary approaches to understanding disease emergence: The past, present, and future drivers of Nipah virus emergence

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Abstract:

Emerging infectious diseases (EIDs) pose a significant threat to human health, economic stability, and biodiversity. Despite this, the mechanisms underlying disease emergence are still not fully understood, and control measures rely heavily on mitigating the impact of EIDs after they have emerged. Here, we highlight the emergence of a zoonotic Henipavirus, Nipah virus, to demonstrate the interdisciplinary and macroecological approaches necessary to understand EID emergence. Previous work suggests that Nipah virus emerged due to the interaction of the wildlife reservoir (Pteropus spp. fruit bats) with intensively managed livestock. The emergence of this and other henipaviruses involves interactions among a suite of anthropogenic environmental changes, socioeconomic factors, and changes in demography that overlay and interact with the distribution of these pathogens in their wildlife reservoirs. Here, we demonstrate how ecological niche modeling may be used to investigate the potential role of a changing climate on the future risk for Henipavirus emergence. We show that the distribution of Henipavirus reservoirs, and therefore henipaviruses, will likely change under climate change scenarios, a fundamental precondition for disease emergence in humans. We assess the variation among climate models to estimate where Henipavirus host distribution is most likely to expand, contract, or remain stable, presenting new risks for human health. We conclude that there is substantial potential to use this modeling framework to explore the distribution of wildlife hosts under a changing climate. These approaches may directly inform current and future management and surveillance strategies aiming to improve pathogen detection and, ultimately, reduce emergence risk.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3586606

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality, Temperature

Food/Water Quality: Pathogen

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

General Geographical Feature

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Zoonotic Disease

Zoonotic Disease: Nipah Virus

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Short-Term (

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content